Quality Assurance Project Plan

Sample Collection Activities for the San Juan River Fish Tissue Contaminant Study (Volume 1 of 2)

Document Control Number 479

Prepared for:

Navajo Nation EPA
Water Quality Program
PO Box 339
Window Rock, AZ 86515

Prepared by:

Tetra Tech
Center for Ecological Sciences
10711 Red Run Blvd., Suite 105
Owings Mills, MD 21117

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Revision 0

This quality assurance project plan (QAPP) has been prepared according to guidance provided in *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5, EPA/240/B-01/003, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC, March 2001) to ensure that environmental and related data are collected, compiled, and/or generated for this project are complete, accurate, and of the type, quantity, and quality required for their intended use. Tetra Tech will conduct work in conformance with the quality assurance program described in the quality management plan for Tetra Tech's Fairfax Group and with the procedures detailed in this QAPP.

Group A: Project Management Elements

A1. APPROVAL SHEET

Eric Rich 3-7-17

Eric Rich Date
Project Manager/Quality Assurance Officer
Navajo Nation EPA

Kim Yazzie 3/5/17

Kim Yazzie Date
Field Crew Leader
Navajo Nation Department of Fish and Wildlife

Audrey L. Johnson 3/14/17

Audrey L. Johnson Date
Project Manager
USEPA Region 9

Eugenia McNaughton

Digitally signed by Eugenia McNaughton
DN: cn=Eugenia McNaughton, o=Quality Assurance Office, ou=EMD 3-2, email=mcnaughton.eugenia@epa.gov, c=US
Date: 2017.03.09 09:17:20 -08'00'

Eugenia McNaughton, PhD Date
Quality Assurance Officer
USEPA Region 9

Blaine Snyder 2/28/17

Blaine Snyder Date
Project Manager
Tetra Tech

Susan Lanberg 2/28/17

Susan Lanberg Date
Quality Assurance Officer
Tetra Tech

Jennifer Pitt 2/28/17

Jennifer Pitt Date
Field Coordinator
Tetra Tech

Tara Cohen 2/28/17

Tara Cohen Date
Laboratory Coordinator
Tetra Tech

A.2 Table of Contents

A3. DISTRIBUTION LIST

Patrick Antonio
Navajo Nation EPA Water Quality Program
PO Box 339
Window Rock, AZ 86515
928-871-7185
panto41815@aol.com

Steven Austin
Navajo Nation EPA Water Quality Program,
Northern Agency
PO Box 1999
Shiprock, NM 87420
505-368-1037
nnepawq@frontiernet.net

Tara Cohen
Tetra Tech
10711 Red Run Blvd., Suite 105
Owings Mills, MD, 21117
410-902-3143
Tara.Cohen@tetratech.com

Audrey Johnson
USEPA Region 9
75 Hawthorne Street
Mail Code: EMD-3-2
San Francisco, CA 94105
415-972-3431
Johnson.audreyl@Epa.gov

Susan Lanberg
Tetra Tech
10306 Eaton Place, Suite 340
Fairfax, VA 22030-2201
703-385-1906
Susan.Lanberg@tetratech.com

Eugenia McNaughton, PhD
USEPA REGION 9
75 Hawthorne Street
Mail Code: EMD-3-2
San Francisco, CA 94105
415-972-3411
McNaughton.eugenia@Epa.gov

Jennifer Pitt
Tetra Tech
10711 Red Run Blvd., Suite 105
Owings Mills, MD, 21117
410-902-3151
Jennifer.Pitt@tetratech.com

Eric Rich
Navajo Nation EPA Water Quality Program,
Western Agency
2717 North Steves Blvd, Suite 2-2
Flagstaff, AZ 86004
928-890-7599
aguapuro@wildblue.net

Blaine Snyder
Tetra Tech
10711 Red Run Blvd., Suite 105
Owings Mills, MD, 21117
410-902-3158
Blaine.Snyder@tetratech.com

Kim Yazzie
Navajo Nation Department of Fish and Wildlife
Nenahnezad Chapter House
West Highway 64, S. County Rd. 6675
NN Route 365
Fruitland, NM 87416
505-402-9098
kyazzie@nndfw.org

A4. PROJECT/TASK ORGANIZATION

This is Revision 0 of the Quality Assurance Project Plan (QAPP) that describes the quality assurance (QA) and quality control (QC) activities and procedures to be used while collecting samples for the Navajo Nation Environmental Protection Agency's San Juan River Fish Tissue Contaminant Study (hereafter referred to as the San Juan River Fish Tissue Study) during March through mid-May of 2017. The purpose of this document is to present the methods and procedures that will be used for the collection of fish tissue from pre-selected sites on the San Juan River, and the QA procedures that will be employed. This document (Volume 1 of 2) addresses only the sample collection effort for this study. Sample processing and analytical testing and methods are addressed in the Analytical Activities QAPP (Volume 2 of 2). This QAPP was prepared according to guidance found in *EPA Requirements for Quality Assurance Project Plans* (USEPA 2001). The sample collection methods are in accordance with the guidelines and recommendations presented in *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories. Volume I: Fish Sampling and Analysis, Third Edition* (USEPA 2000).

The organization of our project team provides the framework for sample collection to meet the study objectives. This framework will facilitate project performance and adherence to QC procedures and QA requirements. Key roles are filled by the staff responsible for the collection and processing of valid data and for routinely assessing the data for precision and accuracy, as well as the persons responsible for approving and accepting final products and deliverables. The project and QA personnel include staff from the Navajo Nation Environmental Protection Agency (NNEPA), the Navajo Nation Department of Fish and Wildlife (NNDFW), the US Environmental Protection Agency (EPA) Region 9, and Tetra Tech. The project organizational diagram is presented in Figure 1, and includes relationships and lines of communication among key project team members.

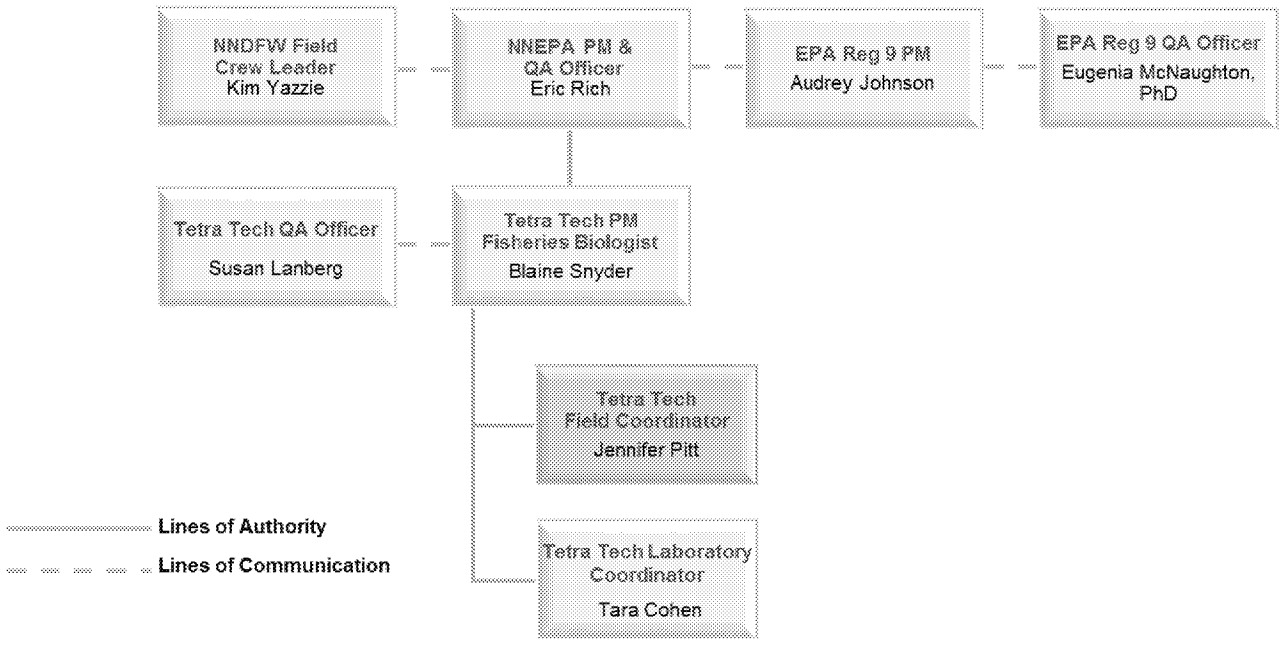

Figure 1: Organizational Diagram

The **NNEPA Project Manager (PM)** is **Eric Rich**. As Project Manager he will provide oversight for study design, site selection, and adherence to design objectives. He will review and approve the QAPP, standard operating procedures (SOPS), and other materials developed to support the project. He will coordinate with Tetra Tech and NNEPA staff to ensure technical quality and contract adherence. He will also serve as the **NNEPA QA Officer.** In this role, he will conduct external performance and system audits of the procedures, and participate in QA reviews of the study. The **NNDFW Field Crew Leader** is Kim Yazzie, who will be responsible for organizing and overseeing all field activities. She will also review and approve the QAPP, and review and evaluate field procedures.

The **EPA Region 9 PM** is **Audrey Johnson**. As Project Manager she will coordinate with NNEPA staff to ensure technical quality and contract adherence. She will review and approve the QAPP, SOPs, and other materials developed to support the project. The **EPA Region 9 QA Officer** is **Eugenia McNaughton, PhD**, who will be responsible for reviewing and approving the QAPP. She will also review and evaluate field procedures, conduct external performance and system audits of the procedures, and participate in QA reviews of the study.

The **Tetra Tech PM** is **Blaine Snyder**, who will coordinate all project assignments and provide oversight for study design, site selection, and adherence to design objectives. He will review and approve the QAPP, SOPs, and other materials developed to support the project. He will provide support to the NNEPA in interacting with the project team to ensure technical quality requirements are met in accordance with project design objectives. He will implement corrective actions and provide professional advice to staff. The **Tetra Tech Field Coordinator** is **Jennifer Pitt**, who will oversee the field activities. She will interact with the NNEPA to organize and coordinate Tetra Tech's involvement in the sampling event. The **Tetra Tech Laboratory Coordinator** is **Tara Cohen**, who will oversee the sample preparation activities. She will also oversee the activities and progress of the analytical laboratory. The **Tetra Tech QA Officer** is **Susan Lanberg**, who will provide support to the NNEPA and the Tetra Tech PM in preparation of the QAPP and SOPs. She will approve the QAPP and monitor quality QC activities to determine conformance.

A5. PROBLEM DEFINITION/BACKGROUND

On August 5, 2015, EPA conducted a study of the Gold King Mine (GKM) near Silverton, Colorado to evaluate water releases from the mine and assess the viability of additional mine remediation (USEPA 2016). During excavation activities, pressurized water began leaking, spilling about three million gallons of water into Cement Creek, a tributary of the Animas River. The Animas River originates in the mountain peaks of San Juan County, Colorado, and ends in Farmington, New Mexico, where it flows into the San Juan River.

EPA's initial monitoring efforts began in the fall of 2015 and continued through the fall of 2016. This monitoring effort focused on identifying changes in water quality, sediment, and biological condition since the GKM release in an effort to characterize the potential impacts of this event. EPA began engaging with State and Tribal partners during this time to discuss expanding the monitoring to better focus on the concerns of local stakeholders in their jurisdictions. This monitoring effort would focus on assessing the condition of sites downstream of the GKM release as compared to water quality standards and sediment risk benchmarks (USEPA 2016).

A6. PROJECT/TASK DESCRIPTION

Tetra Tech will conduct a fish tissue contaminant study in the San Juan River for the NNEPA. The focus will be on prevailing human health risk associated with fish consumption subsequent to the GKM spill, and will be based on monitoring current contaminant levels in fish (specifically metals).

Task 1: Mobilization

Mobilization tasks include all activities that must be completed prior to the San Juan River fish tissue sampling event. The Tetra Tech PM will work with the NNEPA PM to finalize the study design and lay out a timeline for tasks and deliverables. Tetra Tech will communicate and coordinate with the NNEPA PM to lay out the logistical plan for sampling, confirm San Juan River sampling locations, and schedule the work. Tetra Tech will coordinate with the NNEPA PM to prepare and secure approval of the Sample Collection Activities QAPP and Analytical Activities QAPP. Tetra Tech will set up a subcontract agreement with the analytical chemistry laboratory (to be determined). The Tetra Tech PM will coordinate with the NNEPA PM and the laboratory to identify preferred analytical methods. Tetra Tech will also purchase the supplies for field processing (i.e., fish sample wrapping and labeling) and shipment of the fish samples.

Task 2: Implementation

Implementation tasks include all activities associated with sample collection and distribution to the sample preparation laboratory. Tetra Tech will provide one senior fisheries scientist to be on site during a single, 6-day sampling event conducted by the Navajo Nation Department of Fish and Wildlife (NNDFW) personnel. The Field Team will collect fish from five river locations between Farmington, NM and Bluff, UT, focusing on populated areas in the reach (general sampling site locations are presented in Section B1). The Field Team will attempt to collect two composites (e.g., five fish each) from each of the five sampling sites (following the recommendations and methods in EPA's Fish Consumption Advisory Guidance documents) focusing on fishes that are commonly consumed by humans. Every attempt will be made to collect the desired number and species of fish targeted for study, but the success of the sampling effort will ultimately depend on the natural diversity and abundance fish at each location. The Tetra Tech fisheries biologist will coordinate the sample collection and select target species/specimens. The Tetra Tech biologist will wrap, label, and freeze all fish as whole specimens and ship all fish samples via priority overnight shipping service to the Tetra Tech Biological Research Facility in Baltimore, MD.

Task 3: Analysis

Analysis tasks include all activities associated with sample preparation and chemical analysis and will be detailed in a subsequent Analytical Activities QAPP (Volume 2 of 2). To summarize, Tetra Tech will fillet, composite, homogenize, label, and freeze all composite fish samples at the Baltimore, MD Biological Research Facility. Aliquots of frozen tissue homogenates will be shipped to the analytical laboratory via a priority overnight shipping service (e.g., FedEx). Tetra Tech will store extra (archive) tissue at our Biological Research Facility (for possible future analysis or eventual delivery to the NNEPA). The subcontracted analytical laboratory (to be determined) will analyze each composite sample for the following suite of metals: aluminum, antimony, arsenic, barium, beryllium, calcium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium,

silver, sodium, strontium, thallium, vanadium, and zinc (ng/g, wet weight). The lab will prepare electronic and hard copy analytical data deliverables. Tetra Tech will conduct data validation of the analytical results.

Task 4: Reporting

Reporting tasks include all activities associated with documenting sampling and analysis results. Tetra Tech will prepare a technical report summarizing sampling activities and results, analytical results, and fish tissue metal concentrations in relation to human health protection endpoints. The final deliverable will be a single, comprehensive study document.

A7. QUALITY OBJECTIVES AND CRITERIA

Project Quality Objectives

Data of known and documented quality are essential to the success of this monitoring program. Data quality objectives (DQOs) are qualitative and quantitative statements that clarify the intended use of the data, and specify the data quality needed to support specific decisions. DQOs define the type of data needed, identify the conditions under which the data should be collected, and specify tolerable limits on the probability of making a decision error due to uncertainty in the data. Sources of error or uncertainty include the following:

- Sampling error: The difference between sample values and in situ true values from unknown biases due to collection methods and sampling design,
- Measurement error: The difference between sample values and in situ true values associated with the measurement process,
- Natural variation: Natural spatial heterogeneity and temporal variability in population abundance and distribution, and
- Error sources or biases associated with compositing, sample handling, storage, and preservation.

Since this QAPP (Volume 1 of 2) addresses only fish tissue sample collection activities, the relevant quality objectives are related to sample handling aspects. Overall project DQOs are summarized in Section B1, Experimental Design, and further described in QAPP Volume 2 of 2. The required field sampling data are listed in Table 1. Methods and procedures described in this document are intended to reduce the magnitude of the sources of uncertainty (and their frequency of occurrence) by applying the following approaches:

- Using standardized sample collection and handling procedures, and
- Using trained scientists to perform the sample collection and handling activities.

Table 1: Types of Field Data to Be Collected in Association with Fish Tissue Sample Collection.

Data Type	Measurement Endpoint(s) or Units
Fish specimen	Species-level taxonomic identification
Fish length	Millimeters (mm), total length

Measurement Performance Criteria

Measurement performance criteria are quantitative statistics that are used to interpret the degree of acceptability or utility of the data to the user. These criteria are explained below.

Precision

Precision is a measure of internal method consistency, and is demonstrated by the agreement between individual measurements (or values) of the same property of a sample, measured under similar conditions. As this QAPP covers only field sampling, no criteria are required for this parameter. However, sufficient sample volumes are required to allow for the analytical laboratory's assessment of precision.

Accuracy

Accuracy is the degree of agreement between a measurement and an accepted true value. Accuracy is a combination of random error (precision) and systematic error (bias). Since analytical testing is beyond the scope of this QAPP, no accuracy criteria are identified here. However, proper sample handling procedures carried out by qualified field personnel will minimize sample contamination.

Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter, variations at a sampling point, process condition, or an environmental condition. The 5 sampling sites were selected based on NNEPA, NNDFW, and USFWS recommendations and expertise. The sites were selected to best represent commonly fished areas of the San Juan River. The representativeness of the target species (Section B2) for this study was established based on the recommendations of USEPA's *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1: Fish Sampling and Analysis, Third Edition* (USEPA 2000), and input from NNEPA and Tetra Tech scientists. The representativeness goal will be satisfied by using experienced field biologists to ensure that the sample types and locations specified for the study are the samples actually collected.

Completeness

Completeness is the percentage of valid measurements obtained compared to the amount that was expected to be obtained under normal conditions. To ensure the completeness goal, every effort is made to avoid sample and/or data loss. Sample loss during transport or lab activities result in loss of data, which will affect analyses and results. Samples will be stored and transported in sturdy plastic containers (i.e., insulated ice chests). All sample processing (i.e., compositing, filleting, homogenization) will occur in a controlled environment within the laboratory, not in the field. The assignment of specific sample numbers (Section B3) that have undergone chain-of-custody inspection reduce the chance of the sample preparation laboratory overlooking samples when preparing them for processing. Percent completeness (%C) for measurement parameters can be defined as follows:

$$\%C = \frac{v}{T} x\ 100$$

Where v = the number of measurements judged valid and

T = the total number of measurements planned.

For this project, completeness is the number of valid samples collected relative to the number of samples anticipated. Considering the scale of this survey and the limited number of targeted sites, the completeness goal is 100%. This goal is achieved when all of the available samples from the final list of targeted sites are collected and shipped with no errors in documentation or sample handling procedures.

Comparability

Comparability is an expression of the confidence with which one data set can be compared with another. Comparability is dependent on the design of the sampling program and on adherence to the project SOPs and QAPP, which will allow for comparability of data among sites. For the fish tissue collection task, comparability will be accomplished as follows:

- All samples will be collected between March and mid-May, 2017. Adjustments to this schedule may be necessary due to sampling personnel and equipment, and/or weather and water conditions; however, all adjustments must be approved by the NNEPA PM.
- All samples will be collected and prepared for shipment according to the SOPs contained in this QAPP. These procedures are consistent with the recommendations of USEPA's *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1: Fish Sampling and Analysis, Third Edition* (USEPA 2000).
- All field personnel will have adequate training and appropriate experience.

A8. SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

All members of the Field Team (NNDFW staff and the Tetra Tech fisheries biologist) are required to have the education, knowledge, and experience needed to successfully perform all field activities and related QA procedures. This includes both knowledge and experience in the collection and identification of fishes, in the use of fisheries sampling gear specified for the study, and in the operation of small boats if necessary for site access. The Tetra Tech fisheries biologist that will assist on-site is trained and experienced with project-specific sample collection, handling, and shipping procedures.

The field sampling QAPP and SOPs will be distributed to all NNEPA, NNDFW, and Tetra Tech personnel that will participate in the study. Materials will include detailed instructions for each field procedure (i.e., sampling of target fish, proper handling of the sample, shipping, and chain of custody). All personnel will be required to read the SOPs and QAPP, and verify that they read the materials and understood the procedures and requirements.

A9. DOCUMENTS AND RECORDS

All field sample collection and handling activities will be thoroughly documented according to the project SOPs using the following forms and labels (see Appendix A):

- Field Record Form – contains information about each individual specimen and sampling site,
- Sample Identification Label – accompanies and identifies each sample,
- Chain-of-Custody Label – seals each sample shipping container, and
- Chain-of-Custody Form – provides constant tracking information for all samples.

The Tetra Tech fisheries biologist will record all sample records, including a detailed description of each sample collected on a Field Record Form. This form will document the sampling date, time, sampler's name, sampling site location and description, and sample description (count and length of each specimen). The Field Record Form will also contain a unique tracking code (i.e., sample identification code) that will be used to identify each record. The four-character code will include:

- site number (one-digit, i.e., 1-5),
- composite ID (one-digit, i.e., A or B to differentiate the 2 composites collected at each site)
- specimen number (two-digits, i.e., 01-05).

The Field Record Form will be produced as a one-page form on waterproof paper, with the original to be retained by the sampler, and a copy to be included in the sample shipment to the sample preparation laboratory. All entries will be recorded legibly, in ink, with no erasures. Incorrect entries will be crossed out with a single strike mark, and initialed and dated by the sampler.

A Sample Identification Label will be completed to accompany each sample throughout the chain of custody. The label will document the project name, sampling site location, sampling date and time, the sampler's name, and the four-character sample identification code. All entries will be made in indelible ink and will coincide with specimen and sample information on the Field Record Form (Appendix A).

Chain-of-Custody Forms (Appendix A) will accompany each sample shipment. The Chain-of-Custody Forms will document the sample identity, sampler relinquishment date and time, and laboratory receipt date and time. All sample information will be checked before shipment to ensure the records match the information recorded on the Field Record Form. Chain-of-Custody Forms will be produced as three-page carbonless copies, with one copy for the sampler, and two for shipment to the laboratory (i.e., one for the sample preparation laboratory/Tetra Tech PM, and one for the analytical laboratory). Each sample container will be sealed with a Chain-of-Custody Label, and will include the signature of the Tetra Tech fisheries biologist and the date and time sealed. All Chain-of-Custody Label and Form entries will be made legibly, in ink. Field teams will notify the sample preparation laboratory (Tetra Tech Biological Research Facility in Baltimore, MD) by telephone (410-902-3143) of an incoming shipment.

The Field Team will ship all samples from the field to the sample preparation laboratory via priority, overnight express delivery service (e.g., FedEx). The sample preparation laboratory will retain copies of all shipping airbills. The samples will be stored with their original labeling materials until processing. Sample processing activities are outside the scope of this document and will be detailed in a subsequent Analytical Activities QAPP (Volume 2 of 2).

All project documents and records will be maintained by the NNEPA and Tetra Tech during the project, and retained for a period of two years following completion of the project (unless otherwise directed by the NNEPA).

Group B: Data Generation and Acquisition Elements

B1. SAMPLING PROCESS DESIGN (EXPERIMENTAL DESIGN)

The objective of the San Juan River Fish Tissue Study is to provide a screening level assessment to help identify the prevailing human health risk associated with fish consumption subsequent to the GKM spill,

and will be based on monitoring current contaminant levels in fish (specifically metals). The list of target analytes will focus on metals most relevant to the GKM release (USEPA 2016). Additionally, the list of analytes has been expanded to include metals which do not have comparative human health criteria in order to have a baseline and more expansive understanding of metals accumulated in fish tissue. A total of five locations on the San Juan River between Farmington, New Mexico and Bluff, Utah will be sampled.

Sample Type

The Field Team will collect a composite sample from each sampling location. Composite samples are cost-effective for estimating average tissue concentrations of target analytes, and ensure adequate sample mass for analysis. A composite sample will consist of five individuals, all of which will be large enough to provide sufficient tissue for analysis of the group of target analytes. Based on guidance found in USEPA's *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1: Fish Sampling and Analysis, Third Edition* (USEPA 2000), fish used in a composite sample must meet the following criteria:

- all be of the same species,
- satisfy any legal requirements of harvestable size or weight, or at least be of consumable size if no legal harvest requirements are in effect,
- be of similar size so that the smallest individual in a composite is no less than 75% of the total length of the largest individual,
- be collected at the same time (i.e., collected as close to the same time as possible but no more than 1 week apart) [Note: This assumes that a sampling crew was unable to collect all fish needed to prepare the composite sample on the same day. If organisms used in the same composite are collected on different days (no more than 1 week apart), individual fish will be frozen until all the fish to be included in the composite are available for delivery to the laboratory.], and
- be collected in sufficient numbers (five per composite) and of adequate size (harvestable size adult specimens that collectively will provide greater than 100 grams of edible tissue) to allow analysis of recommended target analytes.

The Field Team will include an experienced fisheries biologist that will ensure accurate taxonomic identification to prevent the mixing of closely related species. Individuals from different species must not be used in a composite sample due to notable differences in species-specific bioaccumulation potential.

Sampling Period

The Field Team will collect samples during a time when the target species are most frequently harvested by anglers, and when water and weather conditions are conducive to safe and efficient field sampling. The field sampling period is from March to mid-May, 2017. Any adjustments to this schedule must be approved by the NNEPA PM.

Sample Frame

The target population for the San Juan River Fish Tissue Study is the population of fish residing or moving through the San Juan River between Farmington, New Mexico and Bluff, Utah, that are commonly consumed by humans.

Selection of Sites for Sampling

The five sampling sites were selected based on NNEPA, NNDFW, and USFWS expertise and recommendations. The sites were selected to best represent areas of the San Juan River that are commonly fished. Location, access, and the anticipated success for fishing were considered. The location information for the five sampling sites is provided below in Table 2 and Figure 2.

Table 2: Locations of Five San Juan River Fish Tissue Sampling Sites

Site #	Latitude	Longitude	Description
1	36.750	-108.414	San Juan River near Farmington, NM
2	36.782	-108.693	San Juan River near Shiprock, NM
3	36.993	-108.982	San Juan River near mouth of the Mancos River
4	37.258	-109.310	San Juan River upstream of Montezuma Creek
5	37.258	-109.619	San Juan River near Bluff

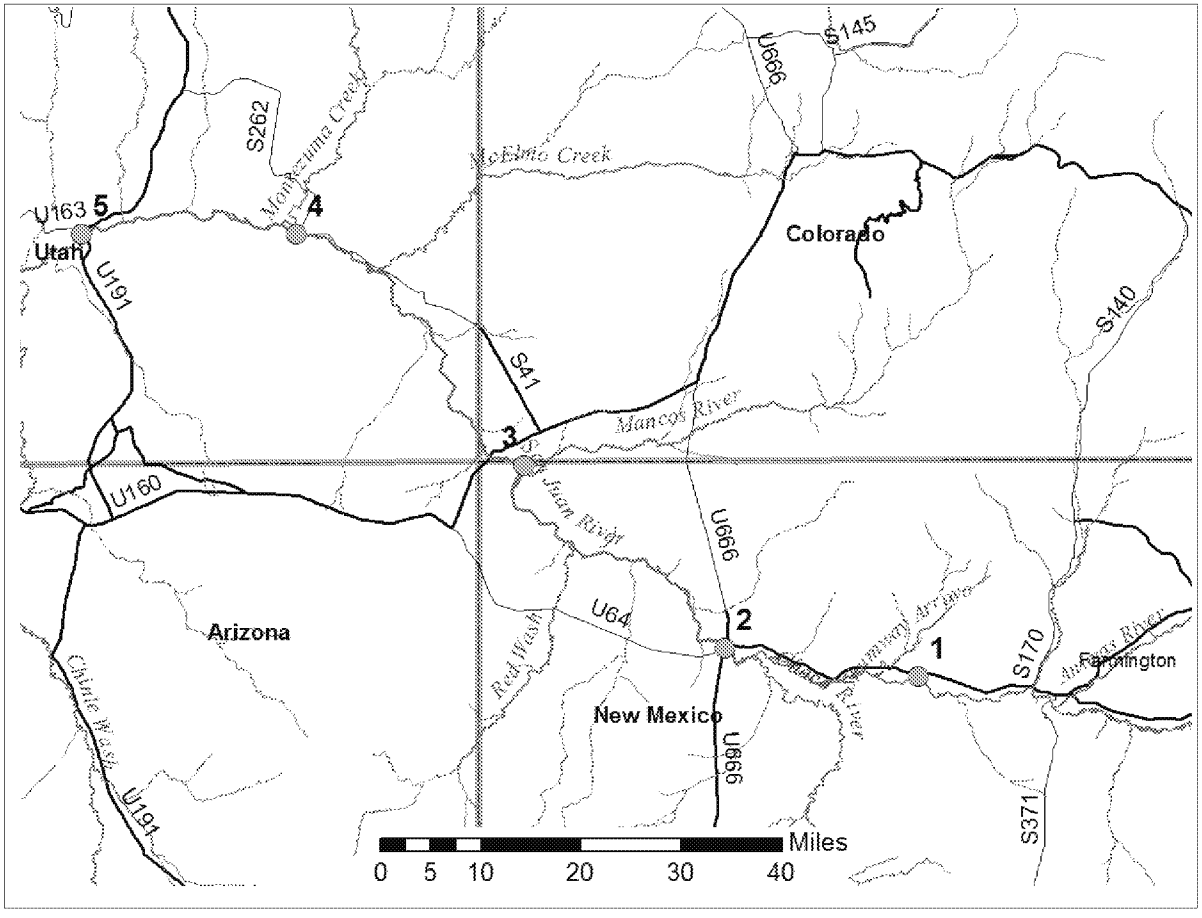

Figure 2: Map of Five San Juan River Fish Tissue Sampling Sites

If the Field Team encounters Razorback Suckers (*Xyrauchen texanus*) and/or Colorado Pikeminnows (*Ptychocheilus lucius*) at a sampling site during the sampling event, the sampling operation will need to be halted at that particular location. If there are logistical or safety concerns that make a site inaccessible (i.e., private property at access point, unsafe access), the sampling operation will also need to be shut down at that particular location. In any such event, the NNEPA and Tetra Tech will immediately confer and decide on a suitable replacement site, if available. The reasons for not sampling a particular site will be documented. If the Field Team is not successful in collecting the sample after a reasonable effort, NNEPA and Tetra Tech will immediately confer and decide on a suitable replacement site. The activities at the unproductive site will be documented.

B2. SAMPLING METHODS

Target Species

Field sampling procedures will follow the guidance found in USEPA's *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume I: Fish Sampling and Analysis, Third Edition* (USEPA 2000). Following this guidance, the project team will select fish that are commonly consumed in the study area, and that may potentially accumulate high concentrations of chemicals (e.g., in this case, bottom dwelling species due to their potential for close contact with river bottom sediments). The project team will also consider species that are easy to identify, abundant, easy to capture, and large enough to provide adequate tissue for analysis. Given these criteria and site-specific recreational fishery information from NNEPA, NNDFW, and USFWS, the primary target species for the San Juan River Fish Tissue Study is Channel Catfish (*Ictalurus punctatus*). Every effort will be made to collect the target species and number of fish; however, the outcome of field sampling efforts will ultimately depend on the natural diversity and abundance of fish at the sampling sites. In the event that the target species is not available at a particular sampling location, suitable replacement species may be selected during the sampling event (in accordance with Sample Type guidance in Section B1) following consultation with the NNEPA PM.

Sample Collection

The Field Team will be equipped with valid Scientific Collection Permits for the San Juan River study reach (obtained by the NNDFW) and an array of active gear appropriate for the location, sampling conditions, and targeted species. The selection of the most appropriate gear type(s) for each site will be determined by the Team's fisheries biologist(s). Active collection methods will include electrofishing units and angling equipment (hook and line).

As fish specimens are obtained, they will immediately be identified to species by the team's fisheries biologist who is knowledgeable of the species in the San Juan River. Nontarget species will be returned to the river. All potential specimens will be handled using clean nitrile gloves. Individuals of the selected target species will be rinsed in river water to remove any foreign material, and placed in a clean holding livewell or bucket to prevent contamination. Each specimen of the selected target species will be measured to determine total body length (the length from the anterior-most part of the fish to the tip of the longest caudal fin ray when the lobes of the caudal fin are depressed dorsoventrally) in millimeters. When five individuals of the target species meeting the size criteria presented in Section B1 have been identified, the species name, specimen lengths, and all other site and sampling information will be recorded on the Field Record Form (Appendix A). A list of equipment and consumable supplies is

provided in Table 3. Sample collection, packaging, and shipment methods are presented as Appendix A, Standard Operating Procedure.

Table 3: Equipment and Supplies

Fishing [a]	
Electrofishing equipment - (including generator, variable voltage pulsator unit, electrodes, wiring cables, dip nets, protective gloves and boots, and all necessary safety equipment)	Angling equipment - OPTIONAL (including fishing rods, reels, line, terminal tackle, trot lines)
Scientific collection permit(s)	Coast Guard-approved personal floatation devices
Livewell and/or buckets	Measuring board (millimeter scale)
Processing [b]	
Heavy-duty food grade polyethylene tubing	Clean nitrile gloves
Large plastic (composite) bags	Plastic cable ties
Knife or scissors	
Shipping [b]	
Ice chests	Dry ice
Packing/strapping tape	Overnight courier airbills
Documentation Paperwork [b]	
Field Record Forms	Sample Identification Labels
Chain-of-Custody Forms	Chain-of-Custody Labels
General [b]	
Maps of target sites and access routes	Global Positioning System (GPS) unit
Clipboard	Black ballpoint pens and/or waterproof markers
	First aid kit and emergency telephone numbers

[a] Provided by NNDFW

[b] Provided by the Tetra Tech Biological Research Facility

B3. SAMPLE HANDLING AND CUSTODY

Sample Handling

All members of the Field Team will wear clean nitrile gloves during the entire sample handling process, beginning as soon as the fish are collected. After collection, each individual will be rinsed in river water to remove any foreign material. After the Team's fisheries biologist determines species and records the size, each of the five fish for the composite sample will be individually wrapped in waterproof heavy duty food grade polyethylene tubing (provided by the Tetra Tech Biological Research Facility) that is cut to size to fit each specimen. For fish with sharp fins, spines may be broken (via gloved hands) to prevent perforation of the wrapping materials. The broken section of the fins will be included with the fish sample. Each wrapped specimen will be placed into a second length of food grade polyethylene tubing (i.e., double bagged) that is cut to size to fit the specimen. Each end of the tubing will be sealed with a plastic cable tie. The Tetra Tech fisheries biologist will prepare a Sample Identification Label (Appendix A) for each specimen, and affix the label to the cable tie. All five fish will be placed inside a large plastic bag so that all specimens from that site are together in a single "composite bag." The large plastic bag will be sealed with a cable tie.

The entire sample package will be immediately placed on dry ice for shipment. Alternatively, samples can be held and transported on wet ice and frozen at an interim (e.g., NNEPA) facility before shipment. All of the specimens in a composite sample should be kept together in the same cooler for transport unless they are too large. The Tetra Tech fisheries biologist has the option of:

- Shipping the samples packed on dry ice (approximately 50 pounds), via priority overnight delivery service (i.e., FedEx), so that they arrive at the sample preparation laboratory within less than 24 hours of sample collection, or
- Freezing the samples within 24 hours of collection (at -20°C), and storing the frozen samples until shipment within 1 week of sample collection. Frozen samples will be packed on dry ice and shipped to the sample preparation laboratory via priority overnight delivery service.

The Chain-of-Custody Form (Appendix A) will be filled out, including times of sample collection, relinquishment by the sample team, and arrival at the sample preparation laboratory. Each cooler will be sealed with a completed and signed Chain of Custody Label. The Tetra Tech fisheries biologist will ship the samples between Monday and Thursday unless prior plans for delivery have been discussed with the sample preparation laboratory (i.e., the Tetra Tech Biological Research Facility).

Sample Integrity

Sample integrity is maintained by preventing the loss of any contaminants present in the sample and by avoiding possible introduction of contaminants during handling. The loss of contaminants is prevented in the field by ensuring that the sample remains intact, i.e., minimizing the laceration of fish skin. Once a sample is collected, sample integrity is maintained through careful and controlled sample handling, storage, and preservation procedures. Sources of outside contamination include sampling gear, oils and greases on boats, spilled fuel, skin contact, contact with soil or sand, and boat motor exhaust. All potential sources should be identified before and during sample collection, and appropriate measures should be taken to minimize or eliminate them. Examples of preventative measures include:

- Ensuring collection nets are free of any potential contaminants.
- Not using tarred collection nets.
- Positioning boats so that engine exhaust does not fall where samples are being handled.
- Scrubbing ice chests and other sample storage containers clean with detergent and rinsing with distilled water prior to use.
- Not placing samples directly on dry ice, but storing inside heavy-duty food grade polyethylene tubing, and plastic garbage bags first.
- Wearing clean nitrile gloves when handling samples.

Custody Requirements

The Tetra Tech fisheries biologist will identify, label, package, and store the sample(s) as soon as possible after collection. Each sample will be assigned a four-character identification code. This number will be used to identify and track the sample on all documentation and records including:

- Field Record Form,
- Sample Identification Label, and
- Chain-of-Custody Form.

The Tetra Tech fisheries biologist will label each individual fish with a Sample Identification Label (Appendix A) filled out with black indelible ink. Each sample label will include the following information:

- project name (San Juan River Fish Tissue Study),
- site name and number,
- composite ID (A or B)
- specimen number (01 through 05),
- date of sample (month/day/year),
- time of collection (military time),
- preservative used (dry ice or frozen), and
- name of field team leader.

The Tetra Tech fisheries biologist will document information about the site and the samples on a Field Record Form (Appendix A). A form will be completed for each composite sample. One page of the form will be retained by the sampler, and a copy of the form will be included with sample shipment. The sample preparation laboratory/Tetra Tech PM will retain the copy. All entries will be made in black ink with no erasures. Each form will include the following:

- Sample identification code (four digits),
- sampling date (month/day/year),
- time of collection (military time),
- collection method (e.g., electrofishing),
- collector's name (printed and signed),
- collector's affiliation, address, and telephone number,
- site location (site coordinates),
- site name and number,
- site description,
- fish species (common name),
- length (mm) of each specimen,
- location, date and time of collection for each specimen, and
- a simple sketch of the sampling site and sample collection points.

The Tetra Tech fisheries biologist will ship all samples to the sample preparation laboratory under chain of custody, which provides a record of sample shipment and documents the contents of each shipment. The information on the Chain-of-Custody Form will match the information on the Field Record Form. The forms will be produced as three-page carbonless copies with one copy retained by the sampler and two for shipment to the laboratory (i.e., one for the sample preparation laboratory/Tetra Tech PM, and one for the analytical laboratory). The two copies will be placed in a waterproof plastic bag and sealed inside the cooler. All Chain-of-Custody Form entries will be made in black ink and will include:

- the NNEPA PM's name, address and telephone number,
- sampler's name and telephone number,
- project name (San Juan River Fish Tissue Study),
- page number (e.g., 1 of 1),
- sample location (site coordinates),
- collection date and time,
- sample identification code (four digits),

- preservative (dry ice or frozen),
- number of containers,
- type of analysis required,
- sampler's signature, sample date, and time,
- sampler relinquishment date and time,
- laboratory recipient signature, and
- laboratory receipt date and time.

The cooler will immediately be sealed with packaging tape and a Chain-of-Custody Label. It will include the date and time and will be signed by the sampler. All entries will be made in ink. The label will be affixed across the opening of the cooler, so that the cooler cannot be opened without breaking the seal. This protects and documents the integrity of the contents from field to laboratory.

B4. ANALYTICAL METHODS

Samples will be shipped under chain of custody protocols to the Tetra Tech Biological Research Facility in Baltimore, MD, for tissue sample preparation. Sample processing and analytical testing and methods are addressed in the Analytical Activities QAPP (Volume 2 of 2).

B5. QUALITY CONTROL

The quality of data generated for this project is ensured through the use of trained, experienced personnel that will consistently follow the SOPs (Appendix A). Project staff will document all project activities according to the SOPs. The QAPP and SOPs will be distributed to all project staff, who will verify in writing that they have read the materials and understand the procedures and requirements. If there is any indication that sample integrity or data quality requirements have not been met, the Tetra Tech QA Officer will be notified immediately (with an accompanying explanation of the problems encountered).

B6. INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

All field equipment and supplies will be inspected prior to sampling activities to ensure they are in good working condition (e.g., boats or electrofishers are operating correctly, nets are without defects). Inspection of field equipment will occur well in advance of sampling activities to allow time for repair or replacement of defective equipment. One designated member of the field team should gather and inspect all equipment and supplies (see Table 3) prior to each sampling event. As possible, the field team will be equipped with proper backup equipment and supplies to prevent lost time in the field.

B7. INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

The equipment used to conduct the field work does not require calibration. All equipment will be maintained as per manufacturer's recommendations and instructions. The calibration of laboratory equipment is discussed in the Analytical Activities QAPP (Volume 2 of 2).

B8. INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

A checklist of field equipment and supplies is provided in Table 3. The sampling team will gather, organize, and inspect the equipment and supplies prior to the sampling event. Defective packaging and shipping supplies (e.g., torn or damaged polyethylene sample tubing) will be discarded and replaced.

B9. NONDIRECT MEASUREMENTS

Nondirect measurements will include the identification and/or verification of each sampling site location (i.e., latitude and longitude). Coordinates for the targeted sampling site are provided in Section B1. Sampling site rejections (due to the presence of threatened & endangered species, access issues, or other reasons) will be immediately reported to the NNEPA PM.

B10. DATA MANAGEMENT

The Field Team will document and track all samples through the consistent use of Sample Identification Labels, Field Record Forms, Chain-of-Custody Forms, and Chain of Custody Labels. The Tetra Tech fisheries biologist will be responsible for completing and reviewing all Field Record Forms. Any corrections will be noted, initialed, and dated. Chain-of-Custody Forms will be prepared in the field using multiple page "carbonless copy" forms. The Field Crew Leader will retain one copy each of the Field Record and Chain-of-Custody Forms, and the remaining copies will be delivered to the sample preparation laboratory with the samples. Sample shipment must be conducted by an overnight delivery service that provides constant tracking of shipments (e.g., Federal Express). The sample preparation laboratory (i.e., the Tetra Tech Biological Research Facility) will retain one copy of each Field Record Form and Chain-of-Custody Form. Tetra Tech will maintain all forms in a project file for 2 years following completion of the project (unless otherwise directed by the NNEPA). Laboratory sample log-in and data management procedures are detailed in the Analytical Activities QAPP (Volume 2 of 2).

Tetra Tech will develop a field collection summary based on information recorded on the Field Record Forms. The summary will be entered into an Excel® spreadsheet and will include a listing of all sampling locations and specimens collected. All data entries will be checked for errors against the original forms by the Tetra Tech QA Officer. Tetra Tech will maintain all computer files associated with the project for the two years subsequent to project completion (unless otherwise directed by the NNEPA).

Group C: Assessment and Oversight Elements

C1. ASSESSMENT AND RESPONSE ACTIONS

Assessment and response actions ensure that sample collection activities are conducted according to the SOPs, and that the project MQOs and DQOs are met. The project QA program includes performance and system audits with independent checks of the field sampling data. Either type of audit could indicate the need for corrective action. The essential steps in the QA program are:

- identify the problem,
- investigate and determine the cause of the problem,
- implement appropriate corrective action,
- verify that the corrective action has eliminated the problem, and
- proceed with work.

The Tetra Tech PM will oversee the Field Team and immediately address questions in the field. The Tetra Tech PM will oversee the review of all Field Record Forms upon receipt, and will communicate the status of the sampling activities to the NNEPA PM on a daily basis. The Tetra Tech PM will immediately consult with the Tetra Tech QA Officer and NNEPA PM regarding any difficulties encountered during sample collection activities. The Tetra Tech QA Officer will initiate the corrective action process described above, documenting the nature of the problem and ensuring that the recommended corrective action is carried out.

The most common corrective action is the resolution of non-routine composite samples. Composite samples should contain five fish, with the smallest fish being at least 75% of the length of the largest fish. If either of these conditions is not met, the sample is considered non-routine. Non-routine samples are not automatically eliminated from the study. Non-routine sample details will be documented in a memorandum to the NNEPA PM so that the sample can be evaluated to determine if it is viable (e.g., sufficient tissue for analysis). The non-routine memo will submitted to the NNEPA PM, and will list each non-routine composite sample and describes species, number of specimens, and specimen lengths. The sample will then be evaluated by the NNEPA PM, who will decide whether it is suitable for inclusion and analysis.

If problems arise that require more formalized, long-term corrective action, the Tetra Tech PM and/or Tetra Tech QA Officer will work with the NNEPA PM to determine the best way to rectify the problem and obtain accurate and useable data. When corrective actions have been taken, the response will be compared with project goals by the Tetra Tech QA Officer and NNEPA PM. The Tetra Tech QA Officer will verify that the corrective action has addressed the problem. The NNEPA PM or QA Manager has the authority to stop work on the project if problems affecting data quality are identified that will require extensive effort to resolve. Failure in an analytical system (e.g., performance requirements are not met) and corrective actions for those failures are beyond the scope of this QAPP.

Performance audits are qualitative checks on project activities. Since the sampling will occur as a one time, weeklong effort, a separate field audit will not be conducted. Instead, the Tetra Tech PM will provide QA oversight throughout the entire duration of sampling. The Tetra Tech PM will ensure that

field activities adhere to field sampling protocols, identify non-compliance issues, and complete corrective actions. Analytical performance audits are beyond the scope of this QAPP.

System audits are qualitative reviews of project activity to check that the overall quality program is functioning and that the appropriate QC measures identified in the QAPP are being implemented. The Tetra Tech QA Officer will conduct one internal system audit during the project and report the results to the NNEPA PM on Tetra Tech's standard Audit Report Form.

C2. REPORTS TO MANAGEMENT

The Tetra Tech PM will contact the NNEPA PM at the end of each sampling day to summarize Field Team activities and progress. Following completion of field sampling activities, Tetra Tech will prepare a field collection effort summary (i.e., detailed listing of all sampling participants, sampling locations, and specimens collected) for review by the NNEPA PM. Following incorporation of NNEPA PM comments and final approval, the summary will be used in the final technical report.

Group D: Data Validation and Usability Elements

D1. DATA REVIEW, VERIFICATION, AND VALIDATION

Tetra Tech will be responsible for reviewing data entries and transmittals for errors, completeness, and adherence to project QA requirements. All Field Record Forms and Chain-of-Custody records will be reviewed by the Tetra Tech PM and QA Officer. Data quality will be assessed by comparing entered data to original data or by comparing results with the measurement performance criteria summarized in Section A7, "Quality Objectives and Criteria," to determine whether to accept, reject, or qualify the data. Results of the review and validation processes will be reported to the NNEPA PM.

D2. VERIFICATION AND VALIDATION METHODS

The Tetra Tech QA Officer will review all Field Record Forms and Chain-of-Custody records. Any discrepancies in the records will be reconciled with the associated field personnel and will be reported to the NNEPA PM. The Tetra Tech QA Officer will check each sampling time and date to verify that holding times have not been exceeded. A holding time violation will immediately be reported to the Tetra Tech PM and NNEPA PM. The Tetra Tech PM and NNEPA PM will decide whether or not to analyze that particular sample. Analytical validation and verification methods will be addressed in the Analytical Activities QAPP (Volume 2 of 2).

D3. RECONCILIATION WITH USER REQUIREMENTS

Upon completion of the sample collection task, Tetra Tech will assess the precision, accuracy, and completeness measurements against the criteria discussed in Section A7, "Quality Objectives and Criteria." If there are any problems in meeting the performance criteria (or uncertainties and limitations in the use of the data) the Tetra Tech PM will immediately inform the NNEPA PM. They will discuss the issues and ways to reconcile the data with user requirements, if possible.

Literature Cited

U.S. Environmental Protection Agency (USEPA). 2000. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1: Fish Sampling and Analysis, Third Edition. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-823-B-00-007.

U.S. Environmental Protection Agency (USEPA). 2001. EPA Requirements for Quality Assurance Project Plans (EPA/QA/R-5). U.S. Environmental Protection Agency, Office of Environmental Information, Washington, D.C. EPA/240/B-01/003.

U.S. Environmental Protection Agency (USEPA). 2016. Post-Gold King Mine Release Incident: Conceptual Monitoring Plan for Surface Water, Sediments, and Biology. https://www.epa.gov/sites/production/files/2016-03/documents/post-gkm-final-conceptual-monitoring-plan_2016_03_24_16.pdf

Appendix A

Standard Operating Procedure: Fish Tissue Sample Collection Procedures for the San Juan River Fish Tissue Study

Standard Operating Procedures

Fish Tissue Sample Collection Procedures for the San Juan River Fish Tissue Study

Scope and Applicability:

This Standard Operating Procedure (SOP) must be followed by all Field Sample Collection Teams involved with the NNEPA San Juan River Fish Tissue Study. Adherence to the SOP will ensure that field sampling activities will be performed the same way every time, i.e., are standardized, for all sampling participants.

Fish tissue sample collection procedures are presented below as sequential steps, and include specific equipment, materials, and methods required to perform field sampling activities only.

Responsibility and Personnel Qualifications:

This procedure will be used by Field Sampling Teams that have been authorized by the NNEPA Project Manager to collect fish for the San Juan River Fish Tissue Study.

References:

U.S. Environmental Protection Agency (USEPA). 2000. Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1: Fish Sampling and Analysis, Third Edition. U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-823-B-00-007.

U.S. Environmental Protection Agency (USEPA). 2001. EPA Requirements for Quality Assurance Project Plans (EPA/QA/R-5). U.S. Environmental Protection Agency, Office of Environmental Information, Washington, D.C. EPA/240/B-01/003.

USEPA. 2009. The National Study of Chemical Residues in Lake Fish Tissue. EPA-823-R-09-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

Precautions:

Follow usual safety precautions for working in the field. Electrofishing equipment should only be operated by qualified, experienced operators trained in their proper use. All personnel must be equipped with the appropriate safety equipment (including personal floatation devices for each field team member). If electrofishing equipment is used for sample collection, each team member must be insulated from the water and electrodes via rubber boots and gloves.

Equipment/Supplies:

Table 1: Equipment and Supplies

Fishing [a]	
Electrofishing equipment - (including generator, variable voltage pulsator unit, electrodes, wiring cables, dip nets, protective gloves and boots, and all necessary safety equipment)	Angling equipment - OPTIONAL (including fishing rods, reels, line, terminal tackle, trot lines)
Scientific collection permit(s)	Coast Guard-approved personal floatation devices
Livewell and/or buckets	Measuring board (millimeter scale)
Processing [b]	
Heavy-duty food grade polyethylene tubing	Clean nitrile gloves
Large plastic (composite) bags	Plastic cable ties
Knife or scissors	
Shipping [b]	
Ice chests	Dry ice
Packing/strapping tape	Overnight courier airbills
Documentation Paperwork [b]	
Field Record Forms	Sample Identification Labels
Chain-of-Custody Forms	Chain-of-Custody Labels
General [b]	
Maps of target sites and access routes	Global Positioning System (GPS) unit
Clipboard	Black ballpoint pens and/or waterproof markers
	First aid kit and emergency telephone numbers

[a] Provided by NNDFW

[b] Provided by the Tetra Tech Biological Research Facility

Procedures:

1. Assemble sampling gear, equipment, and supplies. Selection of the most appropriate gear type(s) for each site will be at the discretion of the experienced on-site fisheries biologist. Detailed procedures for use or deployment of all possible gear types are not included here. Field Teams must be qualified, experienced, and/or trained on the safe and effective use of each gear type selected.

2. Given the site-specific recreational fishery information from NNEPA and USFWS, the primary target species for the San Juan River Fish Tissue Study is Channel Catfish (*Ictalurus punctatus*). In the event that the target species is not available at a particular sampling location, suitable replacement species may be selected during the sampling event (in accordance with the QAPP) following consultation with the NNEPA PM.

3. As soon as fish have been obtained, they must be identified to species. Clean nitrile gloves must be worn during the sample handling process. Potential target species/individuals will be rinsed in ambient water to remove any foreign material from the external surface and placed in clean holding containers (e.g., livewells, buckets). Nontarget fishes or small specimens are returned to the river.

4. Two composites will be retained from each site. Each composite must consist of five fish of adequate size (i.e., adult specimens that collectively will provide greater than 100 grams of edible tissue) for analysis. Select fish for each composite based on the following criteria:

   - all are of the same species,
   - all satisfy legal requirements of harvestable size (or weight), or at least be of consumable size if no legal harvest requirements are in effect,
   - all are of similar size, so that the smallest individual in a composite is no less than 75% of the total length of the largest individual, and
   - all are collected at the same time, i.e., collected as close to the same time as possible, but no more than one week apart (Note: Individual fish may have to be frozen until all fish to be included in the composite are available for delivery to the sample preparation laboratory).

   **Accurate taxonomic identification is essential in assuring and defining the organisms that have been composited and submitted for analysis. Under no circumstances should individuals from different species be used in a single composite sample.*

5. Following selection of five fish for each of the two composites that meet the above-listed criteria for compositing, measure each to determine total body length. Measure total length of each specimen in millimeters, from the anterior-most part of the fish to the tip of the longest caudal fin ray (when the lobes of the caudal fin are depressed dorsoventrally).

6. Record species retained, specimen length, location collected and sampling date and time on the Field Record Form (Figure 1) in black ink. Complete site location description portions of the form, and draw a simple sketch of the sampling area in the space provided. One Field Record Form will be completed for each composite collected from the site.

7. Assign the four-character sample identification code to each specimen as directed on the Field Record Form (Figure 1):

   - Site number (one-digit, i.e., 1-5),
   - Composite ID (one-digit, i.e., A or B to differentiate the 2 composites collected at each site)
   - Specimen number (two-digits, i.e., 01-05).

8. Sign and date the Field Record Form.

9. Remove each fish retained for analysis from the clean holding container(s) (e.g., livewell) using clean nitrile gloves. Dispatch each fish using a clean wooden bat (or equivalent wooden device).

10. Cut a length of food grade polyethylene tubing (provided by Tetra Tech's Biological Research Facility) that is long enough to contain each individual fish and to allow extra length on each end to secure with cable ties. Place each specimen into the appropriate length of tubing. Seal each end of the tubing with a plastic cable tie.

11. Prepare a Sample Identification Label (Figure 2) (in black ink) for each sample, ensuring that the label information matches the information recorded on the Field Record Form.

12. Cut an additional length of food grade tubing that is long enough to contain each individually wrapped fish and to allow extra length on each end to secure with cable ties. Place each specimen into the appropriate length of tubing so that they are now double wrapped (first wrapping was completed in Step 10). Seal each end of the tubing with a plastic cable tie, and attach the appropriate Sample Identification Label using one of those cable ties.

13. Place the entire specimen package inside a large plastic "composite" bag with all specimens of the same species for the single composite sample from that site, and seal with another cable tie.

14. As soon as each sample is packaged, place it immediately on dry ice for shipment. If samples will be carried back to a laboratory or other facility to be frozen before shipment, wet ice can be used to transport wrapped and bagged fish samples in the coolers to a laboratory or other interim facility.

15. If possible, keep all (five) specimens designated for a particular composite in the same shipping container (ice chest) for transport.

16. Samples may be stored on dry ice for a maximum of 24 hours. Sampling teams have the option, depending on site logistics, of:

    - shipping the samples packed on dry ice in sufficient quantities to keep samples frozen for up to 48 hours, via priority overnight delivery service (e.g., Federal Express), so that they arrive at the sample preparation laboratory within less than 24 hours from the time of sample collection, or
    - freezing the samples within 24 hours of collection at -20°C, and storing the frozen samples until shipment within 1 week of sample collection (frozen samples will subsequently be packed on dry ice and shipped to the sample preparation laboratory via priority overnight delivery service).

17. Complete a Chain-of-Custody Form (Figure 3). All entries must be in black ink and coincide with specimen/sample information on the Sample Identification Labels and Field Record Forms.

18. Retain one copy of the Chain-of-Custody Form and Field Record Form, place and seal all other copies in a waterproof bag, and enclose the sealed forms in the shipping container (ice chest).

19. Pack each shipping container (completely) with dry ice, secure each container with packaging tape, and seal it (e.g., across the latch of the ice chest) with a Chain-of-Custody Label (Figure 4). Include the signature of the sampler and the date/time sealed (in black ink) on each Chain-of-Custody Label.

20. Ship each container to the laboratory via priority overnight express delivery service. Monitor sample holding time, and factor time required for shipment/delivery to ensure that the preservation and holding criteria described in Step 16 have been met.

Field Record Form

Sampling Date: _____ Collector Name: _____

Affiliation: _____ Phone: _____

SITE LOCATION

Site ID: _____ Site Name: _____

Latitude: _____ Longitude: _____

Collection Method: _____

SAMPLE DESCRIPTION

Fish Species: _____ Composite ID: _____ Total # of Individuals: _____

Specimen #	Length (mm, TL)	Location	Date/Time	Notes
01				
02				
03				
04				
05				

Additional Comments:

Sampling Site Diagram

Figure 1: Field record for fish samples

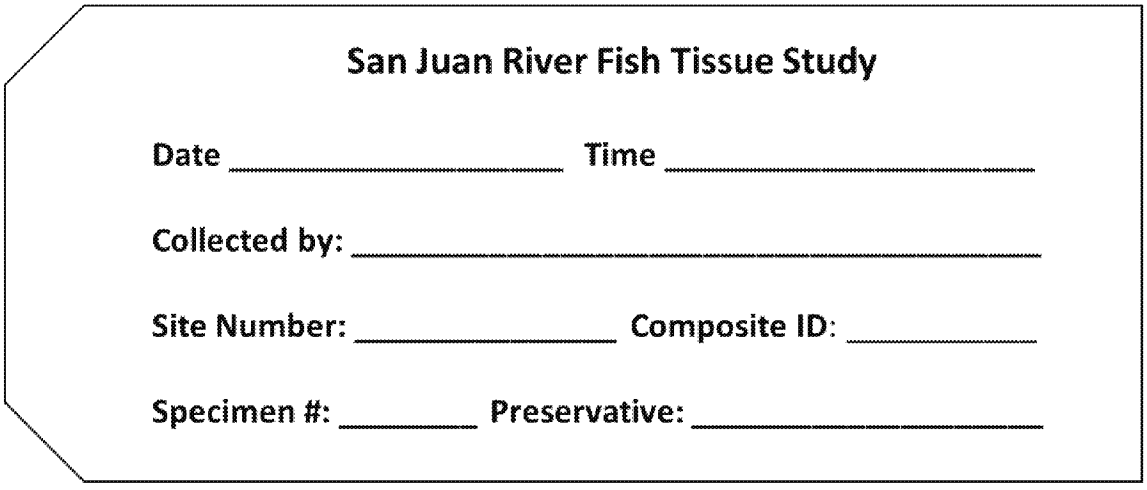

Figure 2: Sample identification label

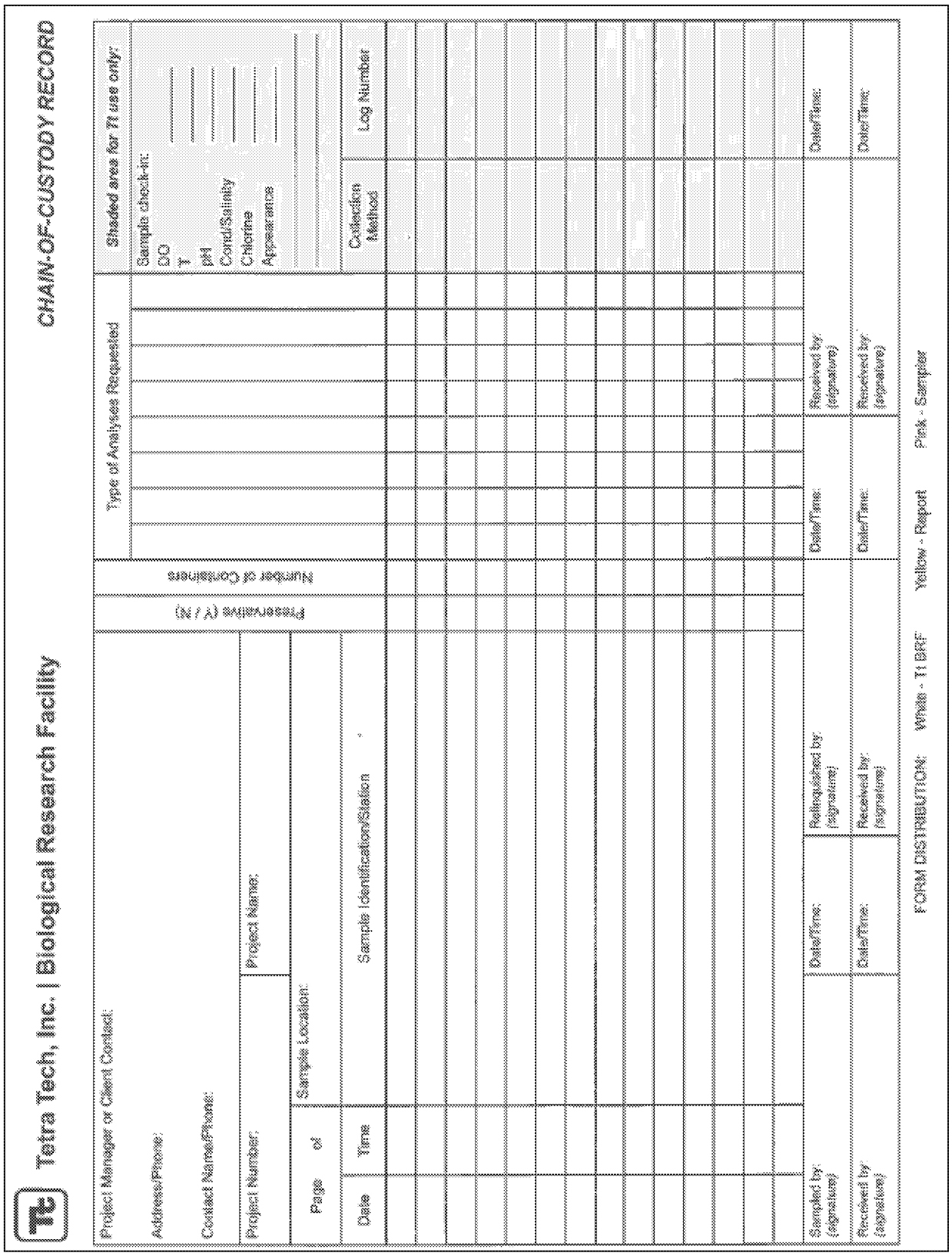

Figure 3: Chain-of-Custody Form

CUSTODY SEAL

Signature_____

Date_____

Figure 4: Chain-of-Custody Label